IND 3.6 C-075

File KF

DUWAMISH SHIPYARD INC.

5658 W. MARGINAL WAY S.W. * SEATTLE, WA 98106 * (206) 767-4880 * FAX: (206) 767-5867

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OCT 23 1990
DEPT. OF ECOLOGY

October 17, 1990

Department of Ecology
4350 - 150th Avenue N.E.
Redmond, WA 98052-5301

Attn: Mr. Kevin Fitzpatrick

Subject: NPDES Permit
No. WA-003093-7
"Sediment Monitoring Plan"

Dear Mr. Fritzpatrick:

This letter is to inform you that the "Sediment Monitoring Plan" as required in Section S4 of our "NPDES" permit is currently being prepared by the firm of Jay W. Spearman, Consulting Engineer. They expect the plan to be complete in about three weeks. After review, we will submit the plan directly to your office.

Thank you for your patience in this matter. If you have and questions or comments, please feel free to call Don Meberg or myself.

Very truly yours,

DUWAMISH SHIPYARD, INC.

E. R. G.

Edson R. Graves
Chief Engineer

IND 3.6

JAY W SPEARMAN
CONSULTING ENGINEER

- MARINE
- STRUCTURAL
- ENVIRONMENTAL PERMITS

(206) 820-1739
820-1740
FAX 820-8475
12040 - 98TH AVE. NE, SUITE 200
KIRKLAND, WASHINGTON 98034

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90-25

November 19, 1990

State of Washington
Department of Ecology
Northwest Regional Office
Water Quality Division
Industrial Permit Section
4350 150th Avenue NE
Redmond, Washington 98052

Attention: Mr. Kevin Fitzpatrick

Subject: NPDES WA-003093-7

Gentlemen:

Enclosed is a draft of the proposed sediment sampling plan for Duwamish Shipyard, Inc. I look forward to your comments so that the sampling plan may be concluded as soon as possible.

Thank you.

Very truly yours,

Jay W. Spearman, Consulting Engineer

JWS/lms

Encl: As stated

ws#1990-01/DOE

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PRELIMINARY

SAMPLING & ANALYSIS PLAN
FOR BASELINE CHARACTERIZATION
OF SEDIMENTS
AT DUWAMISH SHIPYARD, INC.
SEATTLE, WASHINGTON

Prepared by:

Jay W. Spearman, Consulting Engineer
12040 98th Avenue NE, Suite 200
Kirkland, Washington 98034
(206) 820-1739

November, 1990

Revised _____

PRELIMINARY

1.0 INTRODUCTION

Development of this sampling plan is intended to comply with the conditions of NPDES Permit WA-003093-7. Authority for that permit derives from Washington State Water Pollution Control Laws (Chapter 90-48 RCW), and the Federal Clean Water Act (Title 33 United States Code, Section 1251 et seq.).

The purpose of the sediment sampling plan is to develop the sample locations, protocols, and methods of analyses for the first phase of a multiyear sediment monitoring program. The present condition will be referred to as the permit baseline condition. The monitoring program anticipates repeat sampling with analysis on a regular basis at intervals of roughly 5 years. Comparison of chemical analyses and the results of bioassays over these time intervals are intended to detect possible changes in sediment composition that might result from either practices of the permit holder or the adequacy of permit standards and conditions.

2.0 SITE LOCATION

The Duwamish Shipyard site is located on the west side of the Duwamish Waterway, in Section 19, Township 24 North, Range 4 East, Willamette Meridian, approximate latitude 47° 33' 01", longitude 122° 20' 23", see Figure 1. The site address is 3658 West Marginal Way SW, Seattle, Washington 98106.

3.0 SITE HISTORY

The site has been continuously occupied by Duwamish Shipyard since Mr. Aksel Larsen purchased the property for shipyard use in 1939. The shipyard has operated continuously on the property since that time.

The upland portion of the site is owned by Duwamish Shipyard, Inc. The submerged land on which the marine structures are constructed and over which the floating drydocks are located is part of the Duwamish Waterway, overseen by the Port of Seattle, successor to Commercial Waterway District No. 1. The westerly edge of the waterway is roughly located at the top of the bank along the shoreline, and serves as the easterly boundary of the property, as indicated on Figure 1.

The last dredging of marine sediment form the site occurred in two phases. The first phase consisted of dredging approximately 2,500 C.Y. under the drydocks and along the east face of the existing wharf. That occurred in 1981. The second phase consisted of creating the basin at the southeast corner of the site. That required dredging roughly 25,000 C.Y., and was completed in 1982.

PRELIMINARY

4.0 SAMPLE SITE LOCATIONS

The NPDES permit requires the sediment sample sites to be located at sites representative of site sediment conditions just inside the upstream and downstream property lines, between the two floating drydocks and within the marine railway slip. An additional sediment sample is required at an off-site reference station. It is proposed that the reference station be located 100 feet upstream of the property, at the center of the maintained channel. The proposed sample site locations are indicated on Figure 1.

The selection of sample sites needs to take into account the moveable nature of the floating drydocks. This affects the representativeness of the sample sites, because the southernmost drydock may frequently be located at the south property line. In order to obtain an upstream site presumably free of disharge effects and representative of sediment quality arriving on the site, it is considered necessary to locate sample site 2 offshore of the drydock, as indicated on Figure 1. Sample site 3 is located at an easily located point between the drydocks and approximately mid-beam of the drydock. Sample site 4 has been located to reflect the fact that the floating drydock has traditionally been positioned north of the extended upland property line by mutual agreement with the adjoining neighbor to the north. Sample site 5 is located in the intertidal zone in the area of the marine railway.

Sediment samples will be collected to a depth of between two and three inches below the mudline at each sample site.

It is proposed to collect a volume of sediment at each site sufficient for a bioassay in addition to the chemical analysis. The bioassay will utilize Rhepoxynius Abronius because of the estuarine environment.

Following approval of the sampling plan, the permit requires implementation of sampling and analysis within 30 months of permit issuance (August 29, 1989). This requires implementation prior to February 28, 1992. It will require approximately one month to perform the analyses.

PRELIMINARY

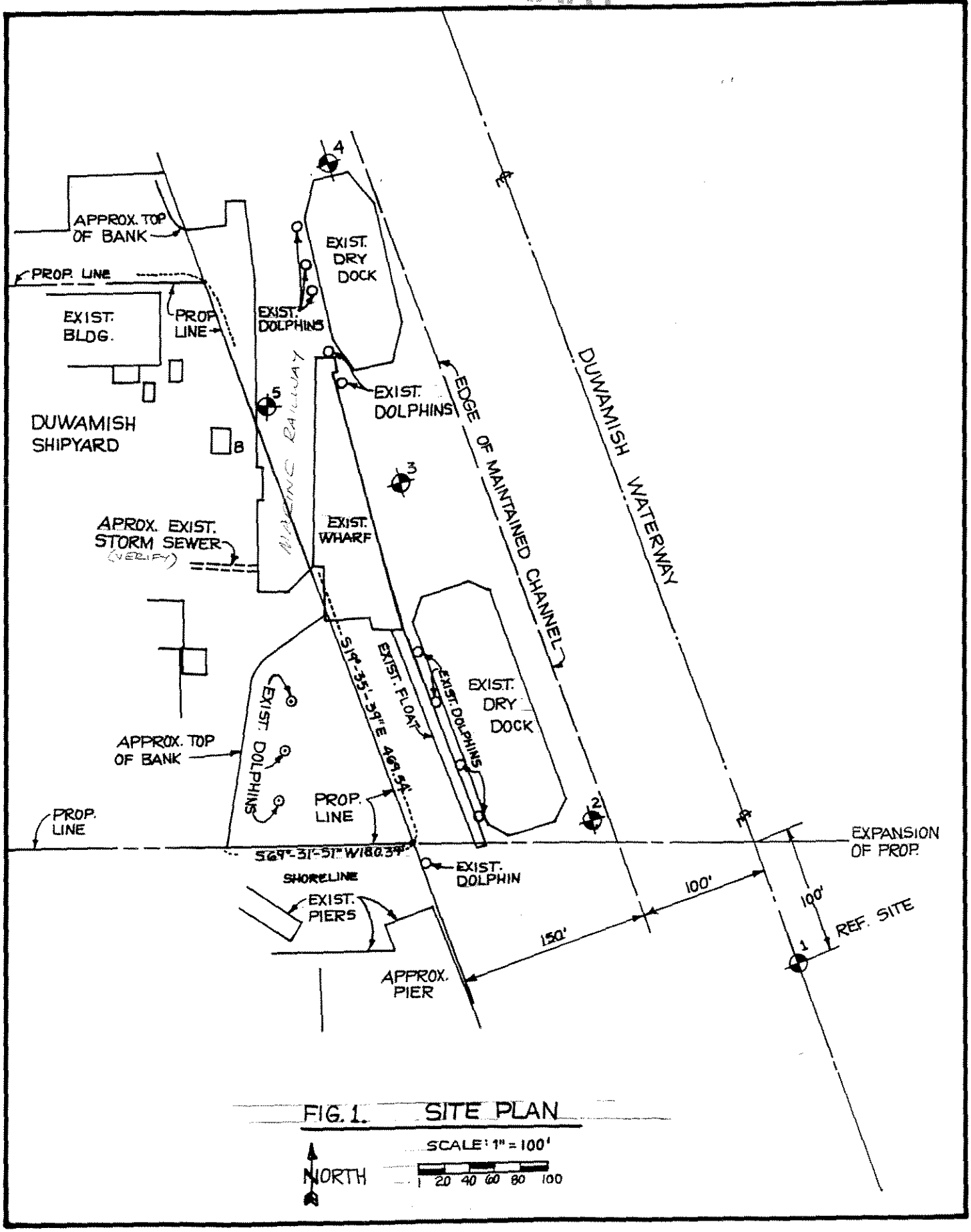

FIG. 1. SITE PLAN

PRELIMINARY

5.0 PROPOSED SEDIMENT SAMPLING AND ANALYSIS PLAN

PROJECT NAME: Duwamish Shipyard NPDES **JOB #:** 90-25

SITE INFORMATION

Site Location: Along Duwamish Waterway

Site Address: 5658 West Marginal Way SW, Seattle, Washington

SAMPLES **ANALYSES**

All samples in top 2" to 3" of sediment. One set of chemical analyses with bioassay at each site.

FIELD STATIONS

STATION NUMBER	APPROX MUD LINE ELEV.	SAMPLE LENGTH
1	-30	2"-3"
2	-25	2"-3"
3	-25	2"-3"
4	-25	2"-3"
5	+5 MLLW	2"-3"

PRELIMINARY

LAB ANALYSES

SAMPLE	STATION/DEPTH	STATION/DEPTH	STATION/DEPTH	STATION/DEPTH	STATION/DEPTH
S-1	1/0-3"				
S-2	2/0-3"				
S-3	3/0-3"				
S-4	4/0-3"				
S-5	5/0-3"				

S = Single Station/Single Stratum
C = Composite
Depth = Sediment depth below mudline

Sampler Type: Van Veen Grab. Multiple samplings may be required to insure adequate volume of sediment for analyses.

Sampling stations will be based on approved locations indicated on Figure 1. At the time of sampling, the sample site locations will be fixed using an electronic distance measuring device operated by a Professional Land Surveyor. Position will be determined to within 2 meters or less. Permanent monumentation will be provided or existing monumentation utilized to permit future relocation of exact sample sites. The longitude and latitude of each sample site will be calculated for the baseline condition sampling.

PRELIMINARY

SAMPLE HANDLING

Sample collection and handling procedures will be conducted in general accordance with procedures prescribed by PSDDA Evaluation Procedures (Technical Appendix, June 1988).

The following information will be recorded:

Sampling personnel and responsibilities

Date and time of collection of each core sample and the name of the person(s) collecting and logging in the sample.

Weather conditions at the time of sampling.

Elevation of each boring station as measured from mean lower low water (MLLW) datum.

Station position within two meters.

Tidal elevation

Water depth at sample station

Penetration lengths and recovery

Sample station numbers

Sample photograph when feasible.

Gross physical characterization in general accordance with the visual-manual description procedure for the following as appropriate and present:

- Amount of sample recovered
- Soil type
- Consistency of soil
- Color
- Presence of oil sheen
- Odor (when apparent)
- Presence of debris
- Biological activity (eg. detritus, shells, tubes, live or dead organisms)
- Visual layers
- Any other distinguishing characteristics

PRELIMINARY

All sampling equipment will be cleaned with deionized water between each sampling event.

Special care will be taken during sampling to minimize any risk of contamination of the samples with oil, grease, hydraulic fluid, etc. If hydrocarbons are observed on or about the rig, absorbent pads will be immediately used to soak up the hydrocarbons.

All hand work (using the sampler; extracting the sample from the sampler, compositing the samples, and filling sample containers; and sample preservation) will be done with stainless steel or teflon utensils.

Sediment from each individual core sample will be placed directly into a stainless steel bowl. The core sample will then be homogenized by stirring with a stainless steel spoon. The homogenized sample will be of a sufficient volume for laboratory analyses and archival storage.

Portions of each sample will be placed into appropriate sample containers which will be obtained from the laboratory performing the analyses. The containers will be either ICHEM or QC bottles or an equivalent. After collection and addition of appropriate preservatives, each sample container shall be firmly sealed. Each container shall be clearly labeled and uniquely identified.

Following sealing and labeling, sample containers will be placed on ice (ice or Blue Ice) in a cooler or container and maintained at 4 degrees C.

Individual sample containers will be packed to prevent breakage and transported in a closed ice chest or other suitable container.

The coolers or containers will be clearly labeled with sufficient information (name of project, time and date to enable positive identification.

Upon transfer of sample possession to the analytical laboratory, the chain of custody form will be signed by the persons transferring custody of the sample container. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples will be recorded by the receiver.

Each cooler or container will be delivered to the laboratory as soon as possible after having been sealed.

Holding time requirements for stored sediment samples are as follows:

Particle size: sediments may be stored at 4 degrees C for up to 6 months.
Total Solids/Total Volatile Solids/Total Organic Carbon: sediments frozen at -20 degrees C may be stored for up to 6 months.
Sulfides & Ammonia: Sediments may be stored for up to 7 days at 4 degrees C.
Metals (except mercury): sediments frozen at -20 degrees C may be stored for up to 6 months.
Mercury: sediments frozen at -20 degrees C may be stored for up to 28 days in glass containers.
Volatile Organics: sediments stored at 4 degrees C may be stored for up to 14 days in glass containers.
Semivolatile Organics: sediments frozen at -20 degrees C may be stored for up to 1 year in glass containers.
Biological Testing: sediments may be stored at 4 degrees C in a nitrogen atmosphere for up to 6 weeks (42 days).

PRELIMINARY

SAMPLING REPORT

A written report shall be prepared by the sampling contractor documenting all the activities associated with sample collection and transportation of samples to the laboratory. As a minimum the following shall be included in the report:

- Protocols used during sampling. *
- Any deviations from the sampling plan protocols and the reasons for those deviations.
- Chain of custody procedures and documentation used. *
- Any deviations from the sampling/analysis plan chain of custody protocols and the reasons for those deviations.
- Descriptions of each core sample (with photographs if possible).
- Methods used to precisely locate the sediment boring locations.
- Appropriate plan view drawings to show where the core samples were collected.
- Location and availability of the field log notebook.
- Description of how each sample was composited.
- Type of sampling equipment used.
- Copy of this sampling plan.

* Note: this sampling plan may be cited in lieu of reiterating protocols.

SAMPLE ANALYSIS

* Samples will be transported to the following laboratories:

Chemical analysis: Laucks Testing Laboratory

Bioassays
Amphipod: Invert-Aid

Physical testing: Laucks Testing Laboratory

CHEMICAL ANALYSIS

Chemical analysis will be done for the chemicals listed in Table 1. Total Organic Carbon will be determined for each sample. Laboratory testing procedures will be conducted in accordance with the method citations in Table 2.

PRELIMINARY

BIOLOGICAL TESTING

Biological toxicity testing will be performed.

Biological toxicity tests may include the following:

1. Amphipod Bioassay
   - 10 day acute bioassay (Rhepoxynius Abronius) in accordance with PSEP protocols.

Each series of biological toxicity tests will include: 1 sample test for control, and 1 sample tested using a reference sediment. The reference sediment is to be from a designated site in Carr Inlet or from another approved site. The reference sediment shall have similar grain size to the sediment being tested. The purpose of the reference material is to isolate grain size effects on Amphipod survival rates. The response of test organisms will be compared to their responses to both control and reference sediments.

PHYSICAL TESTS

A particle grain size analysis will be performed on all samples in accordance with ASTM D 422 (modified). The wet sieve analysis method will be used to determine the size distribution greater than the US No. 230 mesh sieve (0.0625 mm) and include standard sieve sizes numbered 4, 10, 20, 40, 60, 140, 200 and 230. The size distribution for particles smaller than No. 230 mesh sieve will be determined by pipette method. The total solids and total volatiles will be determined for each sample using Standard Methods 209 F.

LABORATORY REPORTING

A brief written report of the results of the physical, chemical and biological tests will be provided, describing the findings. The reporting laboratory will provide the following:

- Results of the laboratory analyses and all QC results.
- All protocols used during analyses. *
- Any deviations from the analysis plan protocols and the reasons for those deviations.
- Chain of custody procedures and documentation used. *
- Any deviations from the sampling/analysis plan chain of custody protocols and the reasons for those deviations.
- Location and availability of the laboratory notebooks used to record the raw data.
- Location and availability of the completed chain of custody forms.

* Note: this sampling plan may be cited in lieu of reiterating protocols.

PRELIMINARY

QUALITY ASSURANCE/QUALITY CONTROL

Quality control for analytical chemistry will include:

- Method blanks: a minimum of one method blank shall be run for every preparation batch. A minimum of 1 method blank per matrix per 20 samples or for every 12 hour shift for GC/MS volatile organics, whichever is more frequent.

- One matrix spike per 20 samples for metals and organics.

- One NOAA reference material analysis per 20 analytical samples for acid base neutrals, pesticides and PCBs.

- Surrogate compound recovery on all samples for organics determination.

- One EPA reference material per 20 samples for metals.

Detection limit goals are summarized in Table 2. Quality control limits are listed in Table 3. These goals are subject to sample volume limitations, sample matrix effects, or other interferences.

PRELIMINARY

CHEMICALS OF INTEREST (TABLE 1)

CONVENTIONALS

Ammonia	Sulfides	Total Organic Carbons

METALS

Antimony	Cadmium	Lead	Nickel	Zinc
Arsenic	Copper	Mercury	Silver	

VOLATILE ORGANIC COMPOUNDS

Trichloroethene	Tetrachloroethene
Ethylbenzene	Xylenes (All Isomers)

EXTRACTABLE ORGANIC COMPOUNDS (ABN)

Phenols and Substituted Phenols:

Phenol	4-Methylphenol	2,4-Dimethylphenol
Pentachlorophenol	2-Methylphenol	

Low Molecular Weight PAH:

Naphthalene	Acenaphthene	Fluorene	Phenanthrene
Anthracene	2-Methylnaphthalene	Acenaphthylene	Total LPAH

High Molecular Weight PAH:

Fluoranthene	Benzo(a)Anthracene	Benzofluoranthenes (total)	
Dibenzo(a,h)Anthracene	Benzo(a)Pyrene	Chrysene	
Indeno(1,2,3-c,d)Pyrene	Benzo(g,h,i)Perylene	Pyrene	Total HPAH

Chlorinated Aromatics:

1,2-Dichlorobenzene	1,3-Dichlorobenzene	Hexachlorobenzene
1,4-Dichlorobenzene	1,2,4-Trichlorobenzene	

Chlorinated Aliphatics:

Hexachloroethane	Hexachlorobutadiene

Phthalte Esters:

Di-methylphthalate	Di-n-butylphthalate	Bis(2-ethylhexyl)phthalate
Di-ethylphthalate	Butylbenzylphthalate	Di-n-octylphthalate

Other Organic Compounds:

N-Nitrosodiphenylamine	Benzoic Acid	Benzyl Alcohol	Dibenzofuran

PESTICIDES/PCB

Total DDT	Aldrin	Alpha Chlordane	Heptachlor	Gamma BHC
Dieldrin	Total PCB's			

PRELIMINARY

TABLE 2
ANALYTICAL DETECTION LIMITS

	SEDIMENT MDL	METHODS PREP	ANAL	PSDDA SL	PSDDA BIOACCUM TRIGGERS
TEST	**(% AR)**				
Total Solids	0.0	SM 209 A			
TEST	**(% DB)**				
Total Volatile Solids	0.1	SM 209 A	SM 209 D		
Total Organic Carbon	0.1	SW 846	SW 9060+		
TEST	**(mg/kg DB)**				
Sulfide	1	PS,P2 pg. 32			
Ammonia	50	SM 417A	SM 417 C		
TEST					
Total Metals:				ppm	(mg/kg)
Antimony	2.5	PS,P4 app D	PS,P4 pg 18*	20	126
Arsenic	0.5	PS,P4 app D	SW 7061	57	393.1
Mercury	0.1	SW 7471	SW 7471	.21	1.5
Silver	0.7	PS,P4 app D	SW 6010	1.2	4.6
Copper	1	PS,P4 app D	SW 6010	81	
Nickel	2	PS,P4 app D	SW 6010	140	504
Cadmium	0.5	PS,P4 app D	SW 6010	.96	
Lead	5	PS,P4 app D	SW 6010	66	
Zinc	1	PS,P4 app D	SW 6010	160	
TEST	**(ug/kg DB)**			ppb	(ug/kg)
GS/MS VOLATILES:					
Trichloroethene	2	NA	SW 8240	160	1168
Tetrachloroethene	2	NA	SW 8240	14	102
Ethylbenzene	2	NA	SW 8240	10	27
Total Xylenes	2	NA	SW 8240	12	
Chlorinated Aliphatics:	**(ug/kg DB)**			ppb	
Hexechloroethane	20	PS,P3 pg. 14#	SW 8240	1400	1022
Hexachlorobutadiene	10	PS,P3 pg. 14	SW 8240	29	212
Phthalte Esters:				ppb	
Di-methylphthalate	10	PS,P3 pg. 14	SW 8270	160	1168
Di-n-butylphthalate	10	PS,P3 pg. 14	SW 8270	1400	10220
Bis(2-ethylhexyl)phthalate	10	PS,P3 pg. 14	SW 8270	3100	13870
Di-ethylphthalate	10	PS,P3 pg. 14	SW 8270	97	
Butylbenzylphthalate	10	PS,P3 pg. 14	SW 8270	470	
Di-n-octylphthalate	10	PS,P3 pg. 14	SW 8270	6200	

NOTE: Glossary located at end of this table.

PRELIMINARY

	SEDIMENT MDL	METHODS PREP	ANAL	PSDDA SL	PSDDA BIOACCUM TRIGGERS
Other Organic Compounds: (ug/kg DB)				ppb	(ug/kg)
Benzoic Acid	216	PS,P3 pg. 14	SW 8270	216	
Benzyl Alcohol	10	PS,P3 pg. 14	SW 8270	10	
Dibenzofuran	10	PS,P3 pg. 14	SW 8270	54	
N-Nitrosodiphenylamine	10	PS,P3 pg. 14	SW 8270	22	161
PESTICIDES/PCBs				ppb	
Total DDT	6.9	PS,P3 pg. 14	SW 8080	6.9	50
Aldrin	1	PS,P3 pg. 14	SW 8080	10	37
Alpha Chlordane	10	PS,P3 pg. 14	SW 8080	10	37
Heptachlor	1	PS,P3 pg. 14	SW 8080	10	37
Gamma BHC	1	PS,P3 pg. 14	SW 8080	10	
Dieldrin	2	PS,P3 pg. 14	SW 8080	10	37
Total PCB's	10	PS,P3 pg. 14	SW 8080	130	38
Phenols and Substituted Phenols:				ppb	
Phenol	10	PS,P3 pg. 14	SW 8270	120	876
4-Methylphenol	10	PS,P3 pg. 14	SW 8270	120	
2,4-Dimethylphenol	10	PS,P3 pg. 14	SW 8270	10	
Pentachlorophenol	69	PS,P3 pg. 14	SW 8270	69	504
2-Methylphenol	10	PS,P3 pg. 14	SW 8270	10	
Low Molecular Weight PAH:				ppb	
Naphthalene	20	PS,P3 pg. 14	SW 8270	210	
Acenaphthene	10	PS,P3 pg. 14	SW 8270	63	
Fluorene	10	PS,P3 pg. 14	SW 8270	64	
Phenanthrene	10	PS,P3 pg. 14	SW 8270	320	
Anthracene	10	PS,P3 pg. 14	SW 8270	130	
2-Methylnaphthalene	10	PS,P3 pg. 14	SW 8270	67	
Acenaphthylene	10	PS,P3 pg. 14	SW 8270	64	
Total LPAH				610	
High Molecular Weight PAH:				ppb	
Fluoranthene	10	PS,P3 pg. 14	SW 8270	630	4600
Benzo(a)Anthracene	20	PS,P3 pg. 14	SW 8270	450	
Benzofluoranthenes	20	PS,P3 pg. 14	SW 8270	800	
Pyrene	10	PS,P3 pg. 14	SW 8270	430	
Dibenzo(a,h)Anthracene	20	PS,P3 pg. 14	SW 8270	120	
Benzo(a)Pyrene	20	PS,P3 pg. 14	SW 8270	680	4964
Chrysene	10	PS,P3 pg. 14	SW 8270	670	
Indeno(1,2,3-c,d)Pyrene	20	PS,P3 pg. 14	SW 8270	69	
Benzo(g,h,i)Perylene	20	PS,P3 pg. 14	SW 8270	540	
Total HPAH				1800	

PRELIMINARY

	SEDIMENT MDL	METHODS PREP	ANAL	PSDDA SL	PSDDA BIOACCUM TRIGGERS
Chlorinated Aromatic Hydrocarbons:				ppb	(ug/kg)
1,2-Dichlorobenzene	10	PS,P3 pg. 14	SW 8240	19	37
1,3-Dichlorobenzene	10	PS,P3 pg. 14	SW 8240	170	1241
Hexachlorobenzene	20	PS,P3 pg. 14	SW 8270	23	168
1,4-Dichlorobenzene	10	PS,P3 pg. 14	SW 8240	26	190
1,2,4-Trichlorobenzene	6.4	PS,P3 pg. 14	SW 8240	6.4	

NOTES

* = HGAA method

\+ = PSEP protocol to be followed where differences exist between this and SW 9060.

\# = Shaker or roller extraction used

MDL = Method Detection Limit

EP = Methods for Chemical Analysis of Water and Wastes, March 1979, U.S.E.P.A. publication #600/4-79-020, Revised March 1983.

SW = Test Methods for Evaluating Solid Waste (SW 846), U.S.E.P.A., 3rd edition, November, 1986.

PS = Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, Puget Sound Estuary Program (Tetra Tech, Inc,), March 1986.

P2 = "Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound," a sub-volume of PS above.

P3 = "Recommended Protocols for Measuring Conventional Organic Compounds in Puget Sound Water, Sediment and Tissue Samples," a sub-volume of PS above.

P4 = "Recommended Protocols for Measuring Metals in Puget Sound Water, Sediment and Tissue Samples," a sub-volume of PS above.

SM = Standard Methods for Examination of Water and Waste, 16th Edition

Table 2 is subject to the following qualifications regarding pesticides, PCBs and semivolatiles:

Total DDT will be reported as the sum of p,p-DDT, p,p-DDD, and p,p-DDE. Total PCBs will be determined using the perchlorination method (no concentrations for individual Aroclors will be reported). At the concentration level required to achieve the screening limits for DDTs and chlordane the possiblity for serious chemical interference when analyzing sediments exists. This may preclude achieving these limits in some cases

PRELIMINARY

and will probably result in reported concentrations for DDTs in many samples.

The cholorinated hydrocarbons, with the exception of hexachlorobenzene, would be determined by GC/MS purge and trap instead of as GC/MS semivolatiles.

In some cases compound identification will not comply with current CLP identification criteria for ion abundance ratios. Compound presence/absence would be determined only based on the ion current of the quantification ion. In those cases the M-flag will be used for any reported analysis (compound identification is based on ion current for major ion only). The compounds which would fall into this group are:

- benzoic acid
- 2-methylphenol
- 2,4-dimethylphenol
- pentachlorophenol
- hexachlorobenzene
- benzyl alcohol

In addition, if these compounds are not detected (i.e., there is no ion current for the major ion) the empirically determined minimum detection limits would still be insufficient to meet the SLs. In that case, another GC/MS analysis will be made in the Selected Ion Monitoring (SIM) mode. This will allow the achievement of the desired level of sensitivity.

PRELIMINARY

TABLE 3
ANALYTICAL CONTROL LIMITS
MATRIX SPIKE RECOVERIES

TEST	SEDIMENT % Recovery
Total Organic Carbon	64-120*
Sulfide	50-150#
Total Metals:	
Antimony	40-96
Arsenic	75-125
Mercury	75-125
Silver	75-125
Copper	75-125
Nickel	75-125
Cadmium	75-125
Lead	75-125
Zinc	75-125
GS/MS VOLATILES:	
1,1-Dichloroethene	59-172
Trichloroethene	62-137
Benzene	66-142
Toluene	59-139
Chlorobenzene	60-133
GC/EXTRACTABLES:	
Phenol	26-90
2-Chlorophenol	25-102
1,4-Dichlorobenzene	28-104
N-Nitroso-di-n-propylamine	41-126
1,2,4-Trichlorobenzene	38-107
4-Chloro-3-methyphenol	26-103
Acenaphthylene	31-137
4-Nitrophenol	11-114
2,4-Dinitrotoluene	28-89
Pentachlorophenol	17-109
Pyrene	35-142
PESTICIDES AND PCBs+	
Lindane	46-127
Heptachlor	35-130
Alrin	34-132
Dieldrin	31-134
Endrin	42-139
4,4'-DDT	23-134

PRELIMINARY

ANALYTICAL CONTROL LIMITS
SURROGATE SPIKE

TEST	SEDIMENT % Recovery
GC/MS VOLATILES:	
d4-1,2-Dichloroethane	70-121
d8-Toluene	81-117
p-Bromofluorobenzene	74-121
GC/MS EXTRACTABLES:	
2-Flourophenol	25-121
d5-Phenol	24-113
2-Bromophenol	30-107*
d5-Nitrobenzene	23-120
2k-Fluorobiphenyl	30-115
d10-Azobenzene	34-123*
2,4,6-Tribromophenol	19-122
di4-p-Terphenyl	18-137
PCBs:	
Dibutylchlorendate	24-154
Isodrin	20-112

= This is an estimated limit and is not based on experimentally derived data.

* = Laucks' Control Limits (all others are EPA Control Limits)

+ = The bioaccumulation trigger value is normalized to TOC

COMMENTS

Where a recovery exceeds the upper control limit, and that control limit was <100%, the recovery will be deemed in control to an upper limit of 120%.

In the case of GC/MS extractables up to two surrogates (one acid and/or one base/neutral compound) may be out of control and the anaylsis be deemed in control, with no requirement for re-analysis.

In the case of the PCB analysis, dibutylchlorendate (DBC) is the CLP surrogate and Isodrin is a second surrogate added at Laucks' discretion.

Every effort will be made to achieve the recovery goals of greater than 50% recovery for organics and 75% for metals. However, the control limits listed above will be used to determine whether the analytical system is in control.